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**Notice of Allowability**

**Application No.**

09/281,528

**Examiner**

Ashwin Mehta

**Applicant(s)**

ROBERTSON, DOMINIQUE

**Art Unit**

1638

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--**

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to papers filed 30 October 2003.
2. ☒ The allowed claim(s) is/are 1,2,5,12,13,15,31,32,42-57 and 62-65.
3. ☒ The drawings filed on 30 October 2003 are accepted by the Examiner.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☐ All    b) ☐ Some\*    c) ☐ None    of the:
    1. ☐ Certified copies of the priority documents have been received.
    2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.  
**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
  6. ☐ CORRECTED DRAWINGS ( as "replacement sheets") must be submitted.
    - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review ( PTO-948) attached
      - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
    - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

- |   |   |
|---|---|
| 1. <input type="checkbox"/> Notice of References Cited (PTO-892)  | 5. <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)                                 |
| 2. <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                | 6. <input checked="" type="checkbox"/> Interview Summary (PTO-413),<br>Paper No./Mail Date <u>2192004</u> . |
| 3. <input type="checkbox"/> Information Disclosure Statements (PTO-1449 or PTO/SB/08),<br>Paper No./Mail Date _____ | 7. <input checked="" type="checkbox"/> Examiner's Amendment/Comment   |
| 4. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit<br>of Biological Material          | 8. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance                        |
|   | 9. <input type="checkbox"/> Other _____.  |

***Drawings***

1. Applicant is notified that the formal drawings for Figures 1A-D and 2-4 have been received.

***Claim Rejections***

2. The provisional rejection of claims 1-41 and 58 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims of copending Application No. 09/876,360 is withdrawn, in light of the abandonment of the copending application.
3. The provisional rejections of claims 1-16, 21, 31, 32, 38-58, 62, and 63 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims of copending Application No. 09/876,503 and/or 09/560,111 are withdrawn. As all other rejections have been overcome, the provisional obviousness-type double patenting rejections will be withdrawn and the application allowed to issue, as directed by MPEP 804(I)(B).
4. The rejections of claims 1, 2, 4-6, 11-16, 21, 31, 32, 38-58, and 62-65 under 35 U.S.C. 112, 1<sup>st</sup> and/or 2<sup>nd</sup> paragraph, are withdrawn in light of the claim amendments or cancellations.
5. The rejection of claims 42 and 46 under 35 U.S.C. 102(b) is withdrawn, in light of the claim amendments.

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6. The rejection of claims 1, 2, 4-6, 11-16, 21, 31, 32, 38-58, and 62-65 under 35 U.S.C. 103(a) is withdrawn, in light of the claim amendments.

***Examiner's Amendments***

7. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Dr. Mary Miller on February 19, 2004.

The application has been amended as follows:

In the claims:

1. A geminivirus silencing vector comprising a geminivirus genome comprising the geminivirus AL1, AL2 and AL3 coding sequences and heterologous DNA, said heterologous DNA comprising, in sense orientation, a fragment of a gene endogenous to a plant, wherein silencing of the endogenous gene is induced when the vector replicates in, and the fragment is transcribed in, a plant that comprises said endogenous gene [the fragment is of a size sufficient to induce silencing].

Claim 4 was cancelled.

In claim 5, line 2, "llinked" was replaced with --linked--.

12. A DNA construct comprising a geminivirus genome wherein the DNA encoding the geminivirus coat protein has been replaced in part or in total with heterologous DNA comprising, in sense orientation, a fragment of an endogenous plant gene, and wherein silencing of the endogenous gene is induced when the geminivirus genome replicates in, and the fragment is transcribed in, a plant that comprises said endogenous gene [the fragment is of a size sufficient to induce silencing].

Claim 14 was cancelled.

42. A geminivirus silencing vector comprising a Tomato Golden Mosaic Virus (TGMV) genome comprising heterologous DNA, said heterologous DNA comprising, in sense orientation, a fragment of a gene endogenous to a plant, wherein silencing of the endogenous gene is induced when the vector replicates in, and the fragment is transcribed in, a plant that comprises said endogenous gene [the fragment is of a size sufficient to induce silencing].

44. A geminivirus silencing vector comprising an African Cassava Mosaic Virus (ACMV) genome comprising heterologous DNA, said heterologous DNA comprising, in sense orientation, a fragment of a gene endogenous to a plant, wherein silencing of the endogenous gene is induced when the vector replicates in, and the fragment is transcribed in, a plant that comprises said endogenous gene [the fragment is of a size sufficient to induce silencing].

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46. A DNA construct comprising a Tomato Golden Mosaic Virus (TGMV) genome, wherein the DNA encoding the TGMV coat protein has been replaced in part or in total with heterologous DNA comprising, in sense orientation, a fragment of an endogenous plant gene, wherein silencing of the endogenous gene is induced when the vector replicates in, and the fragment is transcribed in, a plant that comprises said endogenous gene [the fragment is of a size sufficient to induce silencing].

48. A DNA construct comprising an African Cassava Mosaic Virus (ACMV) genome, wherein the DNA encoding the TGMV coat protein has been replaced in part or in total with heterologous DNA comprising, in sense orientation, a fragment of an endogenous plant gene, wherein silencing of the endogenous gene is induced when the vector replicates in, and the fragment is transcribed in, a plant that comprises said endogenous gene [the fragment is of a size sufficient to induce silencing].

50. A method of silencing the expression of an endogenous plant gene in a plant cell, comprising inoculating said plant cell with a geminivirus silencing vector comprising a geminivirus genome which contains heterologous DNA, said heterologous DNA comprising a fragment of a gene endogenous to said [a] plant cell, wherein episomal replication of said vector and transcription of said fragment in the plant cell results in silencing of said endogenous gene [the fragment is of a size sufficient to induce silencing].

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51. The method [vector] according to claim 50, wherein said endogenous gene [endogenous to a plant] occurs naturally in the [plant] genome of said plant cell.

52. A method of silencing the expression of an endogenous plant gene in a plant cell, comprising inoculating said plant cell with a DNA construct comprising a geminivirus genome, wherein the DNA encoding the geminivirus coat protein has been replaced in part or in total with heterologous DNA comprising a fragment of a [an endogenous] plant gene endogenous to said plant cell, wherein episomal replication of said geminivirus genome and transcription of said fragment in the plant cell results in silencing of said endogenous gene [the fragment is of a size sufficient to induce silencing].

53. The method according to claim 52, wherein said endogenous gene [endogenous to a plant] occurs naturally in the [plant] genome of said plant cell.

54. A method of systemically silencing expression of an endogenous plant gene in a plant, comprising inoculating said plant with a geminivirus silencing vector comprising a geminivirus genome which contains heterologous DNA, said heterologous DNA comprising a fragment of a gene endogenous to said [a] plant, wherein episomal replication of said vector and transcription of said fragment in the plant results in silencing of said endogenous gene [the fragment is of a size sufficient to induce silencing].

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55. The method according to claim 54, wherein said endogenous gene [endogenous to a plant] occurs naturally in the [plant] genome of said plant.

56. A method of systemically silencing expression of an endogenous plant gene in a plant, comprising inoculating said plant with a DNA construct comprising a geminivirus genome, wherein the DNA encoding the geminivirus coat protein has been replaced in part or total with heterologous DNA comprising a fragment of an endogenous plant gene, wherein episomal replication of said genome and transcription of said fragment in the plant results in silencing of said endogenous gene [the fragment is of a size sufficient to induce silencing].

57. The method according to claim 56, wherein said endogenous gene [endogenous to a plant] occurs naturally in the [plant] genome of said plant.

62. A geminivirus silencing vector comprising a Tomato Golden Mosaic Virus (TGMV) genome comprising the TGMV AL1, AL2 and AL3 coding sequences operably associated with an AL1 promoter, and heterologous DNA, said heterologous DNA operably associated with a TGMV coat protein promoter and comprising, in sense orientation, a fragment of a gene endogenous to a plant, wherein episomal replication of said vector and transcription of said fragment in the plant results in silencing of said endogenous gene [the fragment is of a size sufficient to induce silencing].

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64. A method of silencing the expression of an endogenous plant gene in a plant cell of a plant, comprising:

introducing a nucleic acid encoding the geminivirus movement proteins into said plant cell; and

inoculating said plant cell with a geminivirus silencing vector comprising a geminivirus genome comprising heterologous DNA comprising a fragment of a gene endogenous to a plant, wherein episomal replication of said vector and transcription of said fragment in the plant results in silencing of said endogenous gene [the fragment is of a size sufficient to induce silencing].

8. Claims 1, 2, 5, 12, 13, 15, 31, 32, 42-57, and 62-65 are allowed.

9. The following is an examiner's statement of reasons for allowance: Applicant has developed episomally-replicating geminivirus silencing vectors for use in methods to silence genes comprised in plant cells and plants. The vectors comprise a fragment of a gene that is endogenous to the plant cell. Upon introduction of the vector into the cell, the vector replicates episomally in the nucleus and the gene fragment is transcribed, leading to silencing of the endogenous gene. The prior art teaches numerous geminivirus-based vectors (Timmermans et al., Ann. Rev. Plant Physiol. Plant Mol. Biol., 1994, Vol. 45, pages 79-112) used in expressing products encoded by genes. The prior art does not teach geminiviruses comprising fragments of



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genes in sense orientation that caused silencing of an endogenous plant gene. The prior art teaches gene silencing caused by nucleotide sequences that are inserted in vectors based on the genomes of RNA viruses that replicate in the cytoplasm of plant cells (Angell et al., EMBO J., 1997, Vol. 16, pages 3675-3684). However geminiviruses replicate episomally in the nucleus of plant cells. Further, an uncertainty existed in the prior art as to whether silencing of genes in plants could be triggered by homologous sequences carried by geminivirus episomes, as asserted by Kjemtrup et al. (Plant J., April 1998, Vol. 14, page 91). A reasonable expectation of success was therefore lacking as to whether geminivirus-based vectors, carrying sequences from a gene present within a host plant cell, can be used to silence that gene in the cell.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

### ***Contact Information***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ashwin Mehta whose telephone number is 571-272-0803. The examiner can normally be reached from 8:00 A.M to 5:30 P.M. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amy Nelson, can be reached at 571-272-0804. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306 for regular communications and 703-872-9307 for After Final communications. Information regarding the status of an application may be obtained from

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the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

February 19, 2004

A handwritten signature in black ink, appearing to read 'Ashwin D. Mehta', written in a cursive style.

Ashwin D. Mehta, Ph.D.  
Primary Examiner  
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